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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,100	04/07/2004	Zhong Dong	M-15295 US	8965

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EXAMINER	
VU, DAVID	
ART UNIT	PAPER NUMBER
2818	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,100	DONG ET AL.	
	Examiner	Art Unit	
	DAVID VU	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,12-15 and 21-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-15,21-24,26 and 27* is/are rejected.

7)☒ Claim(s) *25 and 28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/15/10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 1-10, 12-15, 21-24, 26 and 27 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Lin et al. (US Pat. 6,127,227, hereinafter Lin) in view of Wang et al. (US 2005/0110102, hereinafter Wang).

Regarding claims 1-8, 10, 15 and 21-24, Lin discloses in figs. 2A-2G a method of forming an ONO-type memory cell stack 160 where at least one sidewall of the ONO-type memory cell stack 160 includes a plurality of exposed material layers respectively composed of

an oxide 143; an oxidizable material (nitride layer 145) disposed adjacent to the oxide 143; and an oxide 147.

Lin fails to disclose forming the sidewall oxide layer on ONO structure 140 by hydrogen and oxygen. However, Wang teaches that the sidewall oxide layer is formed by a dry ISSG process at a temperature is about 800-1000°C, the flow rate of H_2+O_2 is about 1slm –40slm {See **[0032]**; **[0038]** and **[0041]**}, the pressure is about 1-20 Torr, the duration is about 30-120 seconds **[0046]**; the ratio of H_2/H_2+O_2 is in the range about 0.1%-40%, therefore, the ratio H_2: O_2 is about 0.01 (Let x be H_2, y be O_2; x+y = 100% = 1 and x/(x+y) = 0.1; we got x:y = 0.01). It would have been obvious to one with ordinary skill in the art at the time of the invention to form an oxide film by using a dry ISSG process as taught by Wang in the process of Lin. As recognized by one skilled in the art, a dry ISSG process provides excellent thickness control and the thermal budget can be reduced (Abstract).

Note that the dry ISSG process is often described as a process generates short lived oxygen radicals {See Xing et al. (US 20030124873) ([**0026**]-[**0038**]) for evidence of the state of the art in which atomic oxygen is created by an ISSG process}. Furthermore, the conbination of Lin and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics (i.e. generates short lived oxygen radicals whose reactivity extinguishes before the short lived oxygen radicals are able to permeate as deep into the ONO-type memory cell stack and oxidize materials therein as would the reactive oxygen of a High Temperature Oxidation (HTO) process applied to an essentially same ONO-type memory cell stack).

Regarding claim 9, Lin discloses exposed material layers of the ONO-type memory cell stack includes: an ONO stack 140 (fig. 2G).

Regarding claim 12, Lin and Wang fails to disclose a height variation ratio is about 1.20 or less. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Lin and Wang by selecting a suitable thickness/height ratio in order to achieve a specific sidewall dielectric, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges for result effective variables involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, the specification contains no disclosure of either the critical nature of the claimed process/device (i.e. - thickness/height ratio) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitation are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

Regarding claims 13 and 14, as recognized by one skilled in the art that a larger erase speed is obtained in a memory cell after formation of the sidewall dielectric by the dry ISSG process {See Fujimoto et al. (US Pat. 6,830,973); col. 7, lines 32-38 and Applicants specification, paragraph [**0039**]}. Note that the conbination of Lin and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics.

Regarding claim 26, Wang teaches the ratio H_2: O_2 is about 0.01 (which is below 0.3), therefore, it is inherent that the step of flowing the molecular hydrogen towards the stack is

constrained to below a volumetric flow ratio of H_2 to O_2 at which formation of a hydrogen flame due to the presence of H_2 is at least unstable if not that the flame is extinguished or unignited due to insufficient presence of H_2 (see Reply Brief, filed on 03/20/08, page 26, lines 1-4).

Regarding claim 27, Wang teaches the ratio H_2: O_2 is about 0.01 (which is below 0.3), therefore, it is inherent that the step of flowing the molecular hydrogen towards the stack is constrained to below a volumetric flow ratio of H_2 to O_2 at which stable ignition of a hydrogen flame due to the presence of H_2 is assured on a mass production basis (see Reply Brief, filed on 03/20/08, page 26, lines 1-4).

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art cited on the Notice of References is included as teaching the general state of the art relating to the instant invention.

US Pat. 6,699,777 (***Agarwal; figs. 7-9 and col. 3, lines 2-7 and 39-61 & col. 4, lines 16-41***) is cited as teaching a H_2:O_2 oxidation process is performed for forming an oxide spacer on a poly-metal memory cell stack.

US Pat. 5,284,786 (***Sethi; col. 4, lines 34-40***) is cited as teaching an oxidation process is performed for forming an oxide spacer on a sidewall of the ONO-type memory cell stack.

Allowable Subject Matter

3. Claims 25 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

4. Applicant's arguments filed 07/15/10 have been fully considered but they are not persuasive. Applicant argues that Wang does not oxidize a sidewall with at least three materials as in claim 1.

This argument is not convincing, especially since the examiner relies on the ONO structure 140 of Lin and the ISSG process for forming a spacer of Wang. The combination of Lin and Wang meet the structural (ONO stack) and methodological (ISSG process) limitations of this claim, therefore, the prior art (Lin and Wang), as indicated in the above rejection, clearly discloses claimed features. Moreover, oxidize a sidewall with an ONO stack is well known and conventional **(see US Pat. 5,284,786**; ***Sethi; col. 4, lines 34-40***). Note that the ONO stack is a 3 layers structure: oxide/nitride/oxide, which is formed of two materials (oxide and nitride), not three materials.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke H can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/DAVID VU/
Primary Examiner, Art Unit 2818